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GAS ABSTRACTS

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1. GAS INDUSTRY

Annual Review and Forecast

Casper, J. C. LIGHT-HYDROCARBON PRODUCTION SETS ANOTHER ALL-TIME RECORD. *Oil Gas J.* 48, 202-203 (1950) *January* 26.

Production of natural gasoline, LP-gas and other light hydrocarbons at natural gasoline and cycling plants averaged 17,877,000 gallons per day in 1949, a 7.1% increase over the 1948 production. An increase of 4.3% is predicted for 1950. Although substantial yearly increases have been the rule for some years, the trend has been toward smaller increases each year since 1947, indicating a leveling off of demand and production. The greatest relative increase was in 1947, a gain of 14.2% followed by 9.8% in 1948, 7.1% in 1949 and a forecast increase of 4.3% for 1950. A change in the character of the products has also taken place. Since 1941, the percentages of the major products has shifted as follows: LP-gas up to 36.61% from 20.83%; natural gasoline down to 46.18% from 65.03%; other products up to 17.21% from 14.14%. The factors behind this shift and the effect of the shift on market conditions are briefly discussed.

J. C. Lane

Deegan, C. J. PROVEN RESERVES OF BOTH GAS AND LIQUID SHOW GOOD GAIN. *Oil Gas J.* 48, 190-192 (1950) *January* 26.

Proven reserves of crude oil, condensate and other natural gas liquids totaled 28,586 million bbls on January 1, 1950, an increase of 4.6% over those of the same date one year before. Proven dry natural gas reserves increased to 178,136 billion cu ft, up about 1.7%, during the same period. Current reserves and the yearly increase have been tabulated by states.

J. C. Lane

Duff, D. M. NATURAL GAS TURNS IN ANOTHER RECORD-BREAKING PERFORMANCE. *Oil Gas J.* 48, 207-208 (1950) *January* 26.

The natural gas industry continued to expand during 1949 although the operations of the petroleum industry declined slightly. Gains recorded by natural gas are as follows: total customers, 13,319,000, up 8.0% over 1948; total sales, 3,153,335 MMcf, up 8.9%; revenues, $1,097 million, up 10.3%. Continuance of the upward trend is indicated by forecasts of future interstate movements into various areas as follows: New England, none in 1951-1952 but about 140 MMcf per day by 1955-1956; Middle Atlantic, 1,150 MMcf per day in 1951-1952 increasing to 2,550 MMcf by 1955-1956; South Atlantic, from 310 MMcf to 590 MMcf per day over the same period; East Central, from 1,600 to 2,600 MMcf per day; West Central, from 950 to 1,120 MMcf; and other areas from 1,450 to 2,030 MMcf per day.

J. C. Lane

Leech, W. A., Jr. KOPPERS COKE OVEN CONSTRUCTION IN NORTH AMERICA IN 1949. *Blast Furnace Steel Plant* 38, 65-66 (1950) *January.*

The Koppers Company erected eight batteries of by-product coke ovens in North America during 1949, the total carbonizing capacity of which amounted to 2,789,000 net tons per year. Of the 366 ovens constructed, 313 were built in the United States and represent a total capacity of 2,307,000 net tons yearly. The type, location and capacities of these batteries are tabulated.

J. C. Lane

Reed, P. U.S. PIPE-LINE SYSTEMS GAIN 15,000 MILES DURING 1949. *Oil Gas J.* 48, 229, 231, 234-236, 239-240 (1950) *January* 26.

The 15,000 miles of petroleum and natural gas pipe line laid in 1949 exceeded the 1948 and postwar annual average increase by 50%. The scale of pipe-line construction promises to be even greater in 1950. Natural gas lines dominated the 1949 situation, accounting for 10,500 miles of line. Some 22,950 more miles of natural gas lines are under way or planned.

J. C. Lane

Tuttle, R. B. INDUSTRY ADDING BILLION FEET DAILY TO PROCESSING CAPACITY. *Oil Gas J.* 48, 218 (1950) *January* 26.

The nation's natural gas processing plant capacity will be increased by more than one billion

cu ft per day during 1950, a survey of projects building or planned indicates. Most of the projects are under construction, with only about 17% in the planned category. With completion of these projects this year, the total liquid production capacity of all United States natural gas-processing plants is estimated at 32 million gallons per day.

J. C. Lane

DEMAND INCREASE OF 3.2% FORECAST FOR ALL PETROLEUM PRODUCTS IN 1950. *Natl. Petroleum News* **42**, 17 (1950) *January* 25.

The Bureau of Mines has forecast an average demand of 6,315,000 bbls per day for all petroleum products during 1950, including exports of 269,000 bbls daily. A detailed breakdown of production, imports, exports, total demand and domestic demand for refinery products is given for each quarter year. Percentage changes for 1950 as compared with 1949 are estimated as follows: motor fuel, 4.5; residual fuel oil, —1.0; distillate fuels, 12.1; and kerosene, 9.4.

J. C. Lane

Pipe Lines

Reed, P. GAS LINE FROM CANADA. *Oil Gas J.* **48**, 28-29 (1950) *February* 2.

Westcoast Transmission Company, Ltd., of Calgary has proposed a 1,025 mile line to transport natural gas from the vicinity of Edmonton, Alberta, to Vancouver, B.C., Seattle, Washington, and Portland, Oregon. The line would probably be 26 inches in diameter for most of its length and would have a capacity of approximately 300 MMcf per day. The estimated cost of some $114,000,000 would be financed by both Canadian and United States capital.

J. C. Lane

NEW YORK PREPARES FOR NATURAL GAS. *Gas Age* **105**, 15-16 (1950) *February* 2.

The 1840-mile line of Transcontinental Gas Pipe Line Corporation is expected to be delivering gas to the Philadelphia-New Jersey-Metropolitan New York region by November 1, 1950. The corporation has an application pending before the Federal Power Commission to increase the authorized capacity from 340 million to 505 million cu ft per day.

J. C. Lane

Space Heating

Harvey, L. C. GAS HEATING KNOWS NO HORIZON BUT IT MUST BE SOLD TODAY. *Gas Age* **105**, 24-28, 56 (1950) *February* 2.

Gas faces oil today in a struggle for the automatic heating supremacy which is particularly important to the gas industry because of its effect on securing the other home loads such as cooking, water heating and refrigeration. Statistics show that gas heating installations exceeded oil heating installations in 1946 and 1949 but lagged behind in 1947 and 1948 largely because of restrictions necessitated by insufficient gas supplies. With new pipe lines becoming operative, the opportunity exists for gas to invade the North Eastern states, by far the major stronghold of oil heating. Competition will be strong, since the oil industry will cut prices to maintain the market and the price of natural gas in the area will be relatively high because of the transmission distances involved. The premium nature of natural gas will have to be emphasized, and the selling job must be done in advance to provide for use of the large quantities of gas soon available.

J. C. Lane

BACK IN THE GROOVE. *FuelOil & Oil Heat* **9**, 67-73 (1950) *January*.

While the oil burner industry had its second best year in 1949, installing 570,593 central heating units, its sales were topped by the gas burner industry. A comparison of the 1949 figures with those of 1941 shows the tremendous gains made by gas burners, almost completely forcing out new coal stokers and markedly affecting sales of new oil burners. In 1941 oil burners comprised 60.3% of all new automatic heating sales, coal stokers, 33.1% and gas burners only 6.6%. In 1949, gas burner sales led with 49.4%, oil burner sales shrunk to 48.1% and coal stoker sales dwindled to 2.5%. However, of the automatic heating installations now operating, oil burners still predominate with 50.5%; gas burners follow with 35.4% and

coal stokers trail with 14.1%. Types of units, average prices, sizes, sales and number of units operating are presented in a detailed analysis of the automatic heating situation.

J. C. Lane

2. APPLIANCES

Pump

Weiss, L. W. PUMPING SAMPLES OF COMBUSTION PRODUCTS FROM GAS APPLIANCES. *Gas* **26**, 36-37 (1950) *February*.

A description is given of a small capacity gas pump which can be constructed at a minimum cost. This particular unit was built to take continuous sample of combustion products or to fill gas bags with a sample. A material list and the details of assembly are discussed.

E. F. Davis

3. COMBUSTION AND INDUSTRIAL FURNACES

Annealing

Payntor, C. A. SCALE REDUCTION IN CONTROLLED ATMOSPHERE CYCLE ANNEALING. *Ind. Heating* **17**, 42-44, 46, 48-49, 169-170 (1950) *January*.

Scale from forging operations is considerably reduced by forging in an atmosphere containing 25 to 75% hydrogen. A description of a complete production installation is given.

E. F. Davis

Luxon, L. L. SELL SAFE PRACTICES TO SMALL INDUSTRY. PART II. *Butane Propane News* **12**, 47-53 (1950) *February*.

Instructions for the application and use of safety pilots in industrial appliances are discussed.

E. F. Davis

Richardson, H. K. LABORATORY BURNERS NEED SPECIAL ATTENTION WHEN GAS CHANGEOVER OCCURS. *Am. Gas J.* **172**, 12-15 (1950) *January*.

A review is given for the factors which must be considered in converting laboratory gas burners to natural gas. It is generally advisable to modify the orifice size and the primary air opening and to provide a flame retention tip.

E. F. Davis

Combustion

Spalding, D. B. COMBUSTION OF LIQUID FUEL IN A GAS STREAM. *Fuel* (British) **29**, 2-7 (1950) *January*.

A theory is developed for predicting the combustion rate from the physical properties of the fuel by analogy with heat transfer processes. Experiments are described which confirm the validity of the theory and throw light on the laws determining the limits of stable combustion, the occurrence of smoke, and the combustion mechanism. The implications of the theory for the combustion of fuel sprays are discussed, with particular reference to gas turbines.

Author's abstract

Véron, M. A GENERAL COMBUSTION DIAGRAM APPLICABLE TO ANY FUEL. *Engr's Digest* **11**, 18-22 (1950) *January* from *Rev. Universelle Mines* [9] **5**, 150-170 (1949) *May*.

The Pigrais diagram is a generalized combustion nomograph for all fuels. The theory and stoichiometric relationships are presented. Diagrams are illustrated for dry flue gases (1) without free hydrogen, and (2) with free hydrogen.

A. J. Rudnitzki

SUBMERGED COMBUSTION. *Gas J.* (British) **261**, 281 (1950) *February* 1.

A description is given of the development of a process for the treatment of spent pickle from steel works. By evaporation of the water the iron sulfate is recovered as a monohydrate for roasting to SO_2 for conversion to acid again. This process (Swindin) employs submerged combustion to evaporate the water. Many details of the burner design problems are discussed.

E. F. Davis

Dual Fuel Engine

Crump, L. W. DUAL FUEL ENGINE DEVELOPMENT. *World Oil* **130**, 180-181, 184 (1950) *February* 1.

Where supplies of natural gas are available, diesel engines can be converted to a dual fuel composed of natural gas and fuel oil. These engines operate more efficiently and more economically than the diesel when operated near rated load.

E. F. Davis

Flame Structure

Gaydon, A. G. and Wolfhard, H. G. LOW-PRESSURE FLAMES AND FLAME PROPAGATION. *Fuel* (British) **29**, 15-19 (1950) *January.*

The greater thickness of the flame zone at reduced pressures permits spectroscopic study of the flame structure, revealing green C_2 radiation at the base and blue CH radiation above. This radiation is found at temperatures somewhat below 1300°K. For C_2H_2-O_2, C_2H_2-air and C_4H_{10}-air, the measured thickness of the reaction zone is just slightly less than the calculated limit to which hydrogen atoms may diffuse back against the flowing gas stream. The purely thermal theory of flame propagation is rejected for hot (O_2) flames and it is suggested that the major role is played by hydrogen atom diffusion. In hot flames, the burning velocity is nearly independent of pressure.

A. J. Rudnitzki

Forced Convection Oven

Maleady, N. R. FORCED CONVECTION OVENS IN PROCESS ENGINEERING. *Ind. Heating* **17**, 105-106, 108, 110, 112, 114-115 (1950) *January.*

General details of forced convection oven design are given. Design of ductwork, size of oven, heating elements and temperature controls are discussed.

E. F. Davis

Ignition

Elston, J. and Laffitte, P. REGIONS OF INFLAMMABILITY OF METHANE. *Fuel* (British) **29**, 8-12 (1950) *January.*

Anomalous effects are reported in a study of the inflammability limits of methane using closed tubes, high-frequency spark ignition and upward propagation of flame at atmospheric and reduced pressures. CH_4-air in tubes of 16 mm diam, and in concentrations below the usual lower limit, exhibits a separate abnormal peninsular region of inflammability in a plot of pressure vs. concentration. The abnormal flames cover only a small part of the cross-section of the tube. For CH_4-air in 25-mm tubes, the lower limit decreases slowly with decreasing pressure, reaches a minimum at about 250 mm pressure, rises to a maximum at about 275 mm pressure and then falls normally. Similar results are obtained when the nitrogen of the air is replaced with O_2 or argon. With CO_2 replacing the nitrogen in 16-mm tubes, the abnormal peninsular region is found but the normal region is absent. The behavior with helium replacing nitrogen is entirely normal. Data obtained with additions of argon, N_2, He, CO_2, O_2 and CH_4 to the stoichiometric $CH_4 + 2O_2$ mixture are tabulated.

A. J. Rudnitzki

Long, R. EFFECT OF FINE PARTICLES ON IGNITION OF HYDROGEN AIR MIXTURES. *Fuel* (British) **29**, 24 (1950) *January.*

Instances of the auto-ignition of hydrogen streams flowing in air are recounted. The common factor in all instances appears to be the presence of fine particles or droplets capable of developing electrostatic charges due to friction.

A. J. Rudnitzki

Industrial Heat Transfer

Baulk, R. H. INSTRUMENTS AND TECHNIQUES IN INDUSTRIAL HEAT TRANSFER RESEARCH. *Bull. Brit. Coal Utilization Research Assoc.* **13**, 381-387 (1949) *November.*

To bridge the gap between the experimental treatment of combustion chambers and the

more advanced theoretical considerations, precise techniques for the measurement of: (1) heat transmission; (2) emissivity; and (3) flame temperature and heat content of combustion gases, are required. The available experimental methods are reviewed and evaluated. 22 references are included.

A. J. Rudnitzki

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Berk, A. A. and Burdick, L. R. A METHOD OF TEST FOR SO_2 AND SO_3 IN FLUE GASES. p. 50

Weiss, L. W. PUMPING SAMPLES OF COMBUSTION PRODUCTS FROM GAS APPLIANCES. p. 39

4. CARBONIZATION AND GASIFICATION

Benzole Recovery

Fielder, H. L. SOME NOTES ON BENZOLE RECOVERY BY ACTIVE CARBON. *Gas Times* (British) **62**, 185-186, 191, 194, 197 (1950) *February* 10.

A description is given of the benzol recovery plant at Worcester, where active carbon is used for light recovery. The carbon consumption is 7.9 lb per 100 gal of light oil, and recovery averages 3.3 gal per ton of coal. Organic sulfur in the outlet gas is reduced to 9 to 11 grains per 100 cu ft, a reduction of from 40 to 65%. The light oil recovered contains 14.5% forerunnings and 1.3% sulfur. Plant operating costs (including fixed charges, but not the light oil fuel value) are given as 4.7¢ per gal of light oil, as contrasted to a selling price of 13.5¢ per gal.

W. E. Ball

By-Product Coke Oven

Pinckard, P. M. BY-PRODUCT COKE OVEN. *Steel* **126**, 96, 99 (1950) *February* 20.

In order to provide a maximum yield of rich gas by minimizing hydrocarbon cracking, the top of the coal charge and free space is kept at a comparatively low temperature by terminating flues well below the coal level. An exact pressure differential is maintained between oven chamber and flues by circulating gas to free space above charge and using wide flues to assure low pressure drop in the heating system. An elaborate regenerative system is said to minimize counterflow losses.

W. E. Ball

Calorific Value Control

Brown, J. D. THE CONTROL OF CALORIFIC VALUE. *Natl. Gas Bull.* (Australia) **13**, 14-15 (1949) *November-December.*

Dilution of coal gas from horizontal retorts, normally 600 Btu, to a controlled calorific value of 500 Btu (plus or minus 4%) is best accomplished by avoiding leakage of air or flue gas into the retorts, and by addition of producer gas. Control by a retort-house governor to maintain retort pressures near atmospheric will reduce air or flue gas leakage. A recording calorimeter at the outlet of the exhauster on the mixed "make" gas will serve to indicate the adjustments needed in the additions of producer gas. A photometer at this point is a cheaper substitute for the calorimeter. Further mixing of the gas can be attained by pumping from a "make" holder to a send-out holder.

O. P. Brysch

Carburetted Water Gas

Crathorn, S. C. TRENDS IN THE CONTRIBUTION OF CARBURETTED WATER GAS TO TOWN'S GAS PRODUCTION. *Gas Times* (British) **62**, 31-32 (1950) *January* 13; *Gas J.* (British) **261**, 49-50, 55-56 (1950) *January* 4.

A thorough review is presented of carburetted water gas technique including experiences with the use of one-in. coke as generator fuel, generation of high pressure steam to improve thermal efficiency, the use of hydraulic oil pressure for automatic valve operation, heavy oil operation in checkerless carbureters and methods for increasing plant capacity such as by: (a) blow run cycle; (b) increasing the oil rate during carburetion to produce a higher calorific value gas; and (c) conversion to a reforming operation. Due to its flexibility the car-

buretted water gas process is very satisfactory for peak load operation. Since its investment cost is lower than that of a coal gas plant and with other factors permitting, the author recommends eventual conversion to carburetted water gas as base load gas. A cost comparison is included.

C. Von Fredersdorff

Crathorn, S. C. TRENDS IN THE CONTRIBUTION OF CARBURETTED WATER GAS TO TOWN'S GAS PRODUCTION. *Gas Times* (British) **62**, 123-124, 126 (1950) *January* 27.

Experience has shown that the carburetted water gas process is both reliable and flexible, making it very useful during peak load periods. Methods of meeting a sudden demand for gas consist of simple modifications of the process such as: (a) increasing the heat storage in the system by burning a portion of the blast gases in the carburetor and superheater, making it possible to crack more oil and increase the gas calorific value up to 650 Btu/cu ft, with a resultant 20% increase in the thermal capacity of the set; (b) adoption of a blow-run cycle whereby the blast gases near the end of the blasting period are passed into the make gas line, resulting in an increased volumetric capacity and slightly higher gas specific gravity; (c) incorporating a reforming operation whereby a portion of the gas-oil is passed through the top of the generator fire by use of a back run cycle instead of the usual down run period, resulting in the use of more oil, less coke and an increased volumetric output. Reforming operations have been successful with refinery oil gas, natural gas, gas oil, and liquefied petroleum gases such as butane. Some experiences are cited on the maintenance of lubricated steam valves, hydraulic rams on the various operating valves, refractory brick arches, and cast-raches in the carbureter and superheater. A recommendation is given for CWG as a base load process instead of the present coke ovens, for the principal reasons that the CWG plant: (a) requires less capital investment, space, operating personnel, and maintenance; (b) produces less effluents; and (c) is more flexible.

C. Von Fredersdorff

THE TECHNIQUE OF C.W.G. MANUFACTURE. *Gas Times* (British) **62**, 37, 40, 45-46 (1950) *January* 13.

A discussion is reported on a paper entitled "Carburetted Water Gas" presented to the Midland Junior Gas Association, Birmingham, England, covering experiences on disposal of coke fines, preheating blast and steam, use of tertiary air at the waste heat boiler, heavy oil operation in checkerless carbureters, oil consumption and valve difficulties.

C. Von Fredersdorff

Catalytic Reforming

Schlegel, C. A. THE CYCLIC CATALYTIC REFORMING PROCESS FOR REFORMING NATURAL GAS. *Gas* **26**, 26-29 (1950) *February*.

The UGI cyclic catalytic cracking process is described, and results obtained from about 4½ months of plant operation are presented. The work was conducted at the Station A Plant of the Philadelphia Gas Works in the 9-foot i.d. superheater of an 11-foot o.d. carburetted water gas set. The output varied from 7 MMcf to 9.4 MMcf of catalytically reformed natural gas which provided from 10.6 to 15.7 MMcf of 530 Btu gas after enrichment with natural gas. The single superheater shell contained a combustion chamber at the bottom for burning natural gas with air which provided the necessary heat for the process upon passing upward first, through a preheat zone and then, through a bed of nickel catalyst. The natural gas and steam were also introduced at the bottom in cyclic fashion when the blast run was ended. The process was automatic and, except for a new automatic control machine, only piping changes need be made at an estimated cost of $15 to $25 per Mcf of installed daily capacity of 530 Btu enriched gas. Cost per Mcf for a new set will be somewhat higher. The catalyst was a commercial nickel catalyst and no evidence of deterioration was observed after 4½ months of operation. Operating savings paid for the catalyst in the first 35 days of use. Savings in production cost result from the use of natural gas instead of coke at a lower per therm price, from a reduction in operating

labor (no fire cleaning) and in maintenance, as well as from the fact that only slight purification is needed (less than 0.5 grains H_2S per 100 cu ft of reformed gas). The process worked satisfactorily as to interchangeability with a 530 Btu standard gas and is believed satisfactory from laboratory tests on a 650 Btu sendout gas.

C. H. Riesz

Coal Properties

Davis, J. D., Reynolds, D. A., Naugle, B. W., Wolfson, D. E. and Birge, G. W. CARBONIZING PROPERTIES OF THICK FREEPORT AND PITTSBURGH COALS FROM PENNSYLVANIA, ELKHORN COAL FROM KENTUCKY, AND AMERICA AND MARY LEE COALS FROM ALABAMA. U.S. Bureau of Mines Technical Paper 726 (1949).

This paper describes the properties of coals, from 5 seams and 9 different mines, which are carbonized commercially by the Republic Steel Corporation. These coals ranged from 21 to 35.7% volatile matter. The coals were carbonized at 800, 900 and 1000°C in the size distribution normally used in commercial ovens and also at 900°C recrushed sizes. For the Sayreton mines (Ala.) five specially crushed samples were tested for bulk density. Plastic properties and expanding properties also were determined. Research engineers of the Republic Steel Corporation present a correlation of yield data for 5 coke plants and the BM-AGA tests.

O. P. Brysch

Distribution

EXPERIENCE WITH NATURAL GAS-MANUFACTURED GAS SYSTEMS. *Am. Gas Assoc. Monthly* **32**, 14-18 (1950) *January.*

The experiences are related of several authorities on the problems encountered in converting distribution systems to natural gas. Problems discussed include the deposition of gum, oil fogging, drying of meter diaphragm, odorization and leak detection, and experiences with sulfur in natural gas.

E. F. Davis

NEW IDEAS FOR DRY GAS METERS. *Gas World* (British) **131**, 111 (1950) *January* 28.

A summary of French Patent No. 630,256 describing a single bellows dry meter utilizing four valves is given.

E. F. Davis

Gasification

GASIFICATION OF POWDERED COAL. *Coke & Gas* (British) **12**, 6-8, 28 (1950) *January.*

A review is presented of the several well publicized gasification processes for the production of synthesis gas from powdered coal, oxygen and steam, namely: the Winkler process for converting non-caking coal in a fluidized bed, the Lurgi method for gasifying particles in a fixed bed under pressure, and the Koppers Dust Gasification process operating with coal in suspension. Some operating data are included.

C. Von Fredersdorff

Oxygen Plant

OXYGEN PLANT DESIGN STANDARDIZED. *Petroleum Refiner* **29**, 138 (1950) *January.*

A standard 10 ton/day oxygen plant capable of producing 95% purity oxygen has recently been announced by the Stacey Dresser Engineering Company. A brief summary of design data indicates that utility requirements are 10 lb/hr low pressure steam, 80 gpm cooling water and 181 kw electricity (380-440 volt) for power. The plant occupies an area measuring 24 x 32 ft.

C. Von Fredersdorff

Purification

Williamson, R. H. and Garside, J. E. AN APPLICATION OF THE FLUIDIZED SOLIDS TECHNIQUE TO COAL GAS PURIFICATION. PART II. Institution of Gas Engineers Communication 357 (1949) November 29.

The laboratory development of two processes for the purification of coal gas from hydrogen sulfide is described, and results obtained by

their use are presented. Both processes employ powdered iron oxide as purification material and are direct applications of the fluidized solids technique, but whereas in the one the sulfiding and oxidation reactions proceed independently of one another in separate vessels, in the other both reactions proceed simultaneously in a single vessel. An advantage of the former process is that the oxygen and inerts contents of the purified gas are low, but the latter process is simpler and should be cheaper both to install and to operate.

Authors' summary

Vertical Retorts

Cottrell, A. F. MAINTENANCE OF VERTICAL RETORT PLANTS. *Gas J.* (British) **261**, 152-154, 159-160 (1950) *January* 18.

Maintenance is discussed with emphasis on coke extraction and retort-bottom mechanism, and on charging, gas-offtake, liquor circulation and disposal apparatus. Care of gas producers and of retort benches is treated also.

O. P. Brysch

Laming, J. and Rigby, G. R. THE DURABILITY OF CARBONIZING REFRACTORIES IN CONTINUOUS VERTICAL RETORTS. Gas Research Board GRB-53, 6-26 (1949) November.

Laboratory tests and examination of vertical retort refractories showed that refractory failure was mainly due to deposition of carbon on the surface and in the pores of silica bricks. The carbon caused a permanent dilation of the specimen and a serious reduction in strength. Burning out the carbon led to surface flaking in certain cases. The carbon is believed to be capable of penetrating into the boundaries between individual crystabolite crystals in a silica grain.

W. E. Ball

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

James, L. S. INSTRUMENTATION AND GRID CONTROL—SOME FURTHER DEVELOPMENTS. p. 54

Markovits, J. A., Braun, K. C., Donovan, J. T. and Sandaker, J. H. SPECIAL EQUIPMENT IN THE COAL-HYDROGENATION DEMONSTRATION PLANT. p. 54

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Compressor Stations

Hicks, T. G. GAS-COMPRESSOR STATIONS. I. FOUNDATIONS AND BUILDINGS. *Oil Gas J.* **48**, 92-94, 122 (1950) *February* 16.

This is the first of a series of articles discussing compressor stations and deals with foundations and buildings.

J. D. Parent

Hicks, T. G. PLANNING MODERN GAS-COMPRESSOR STATIONS. II. COMPRESSOR CHARACTERISTICS AND INSTALLATION. *Oil Gas J.* **48**, 183-185, 188, 190, 192 (1950) *February* 23.

General information of compressors is presented. Proper pipe sizing is stressed.

J. D. Parent

Sollars, R. C. MOBILE LABORATORY USED IN COMPRESSOR STATION SURVEYS. *Gas Age* **105**, 19-22, 60 (1950) *February* 2.

A description of the mobile laboratory used by the Fluor Company making vibration analyses is provided.

J. D. Parent

Conditioning

Riesenfeld, F. C. and Cody, K. E. SIMULTANEOUS DESULFURIZATION AND DEHYDRATION OF NATURAL GAS AT COALINGA, CALIFORNIA. *Petroleum Engr.* **22C**, 31-32, 34 (1950) *January*.

The application of the glycol-amine process in the gasoline plant at Coalinga, California is described. It is said to operate satisfactorily in the combined sweetening and dehydration process. Process details are given.

J. D. Parent

Conservation

Foster, A. L. GAS CONSERVATION BY REPRESSURING, NATURAL GASOLINE RECOVERY, AND FUEL USE. *Petroleum Engr.* 22C, 21, 24-27 (1950) *January.*

A description with a flow diagram is given of the Natural Gasoline-gas processing plant recently placed in operation by American Republics Corporation at Silsbee, Texas. The plant processes gas from several sources at widely different pressures with a total of 55 MM CFD of gas handled. Absorbers are operated at pressures of 2000, 900, 500 and 250 psi. Performance data on three of the absorbers is included. Products include gasoline, kerosene, absorption oil, propane, and butane. The stopped gas from the high pressure absorber is repressurized for cycling. Most of the gas from the lower pressure absorbers goes to sales.

O. T. Bloomer

Cycling

Muskat, M. SOME THEORETICAL ASPECTS OF CYCLING. PART II. *Oil Gas J.* 48, 53-55, 60 (1950) *February* 2.

A theoretical analysis is presented of (1) the quantity and extent of retrograde liquid accumulation in the vicinity about a well bore hole caused by the pressure drop required to produce the flow; and (2) the effect of permeability nonuniformity on the pressure or blowdown period of operation of a gas field. The analysis of item (1) demonstrated that this factor would result in only negligible losses of retrograde liquid. The analysis of item (2) was made with the idealized assumption of perfect stratification with no cross flow. Nonuniformity in permeability may have a serious effect on the production capacity of the field and could result in higher average abandonment pressures. This because the highest permeability zones will be reduced to much lower pressures than the tighter strata, with a resultant loss in capacity.

O. T. Bloomer

Phase Equilibria

Culberson, O. L., Horn, A. B. and McKetta, J. J., Jr. PHASE EQUILIBRIA IN HYDROCARBON-WATER SYSTEMS. *J. Petroleum Technol. "Trans. Section"* 1-6 (1950) *January.*

Studies on the solubility of ethane in water at pressures up to 1200 psia and at temperatures in the range of 100 to 340 °F are reported. A good bibliography is presented.

J. D. Parent

Pipe Lines

Gilbert, T. H. USE AND ABUSE OF HOLIDAY DETECTORS. *Gas* 26, 82, 84 (1950) *February.*

The problem of proper voltage to be used in holiday testing is discussed and a table of recommended voltages is presented.

J. D. Parent

Hill, A. M. TAPPING PIPE LINES UNDER PRESSURE. *World Oil* 130, 176-178, 184 (1950) *February* 1.

The use of tapping machines to provide connections to oil and gas lines under pressure is briefly discussed. A tapping machine is now being developed for drilling and plugging openings from 11½ to 22¾ inches in diameter with a boring bar travel up to 36 inches.

O. T. Bloomer

Lyle, H. N. CASING-LEAK PROBLEMS. *Oil Gas J.* 48, 78-79, 82 (1950) *February* 9.

Causes of leaks developing in casing are discussed briefly. Methods of detecting and repairing are also mentioned.

J. D. Parent

Mudd, O. C. PREPARATION OF PIPE SURFACE FOR BITUMEN COATING DURING RECONDITIONING. *Corrosion* 6, 19-22 (1950) *January.*

Methods of cleaning pipe after removal from soil in the preparation for bitumen coating application are discussed. Methods discussed are: (1) mechanical cleaning; (2) sand or

"grit" cleaning; and (3) flame cleaning. Some reduction in mechanical cleaning can be compensated for by applying a dilute primer one part primer with approximately four parts primer thinner) to the freshly cleaned surface. This coating tends to remove the moisture from tightly adhering corrosion products. This is followed by regular consistency primer and then hot asphalt enamel.

O. T. Bloomer

Rohman, A. NEW LONG RADIUS ELLS IN CALIFORNIA LINE WILL AID IN CLEANING OPERATIONS. *Am. Gas J.* **172**, 19-20 (1950) *January.*

Long radius ells (three times the diameter of the pipe) are being used by Southern Counties Gas Company in large diameter high pressure transmission lines. These ells facilitate cleaning with "pigs" or other cleaning devices.

O. T. Bloomer

Stormont, D. H. FLOWLINE PARAFFIN REMOVAL. *Oil Gas J.* **48**, 91 (1950) *February* 16.

A new valve which contains a built-in bypass and an aperture for inserting a soluble plug is an improvement on previous methods of operation. Soluble plugs have been used for some time but until the development of this valve the well had to be taken off production or bypassed and the flowline connections had to be broken. This new valve eliminates these difficulties.

W. G. Bair

EMERGENCY CUTOFF FOR NATURAL GAS PIPE LINES. *Gas Age* **105**, 29, 51-52 (1950) *February* 2.

Precautions taken by one company for closing intake and discharge valve on the lines to the compressor station are described.

J. D. Parent

SUPER MACHINES BUILDING "SUPER INCH" LINE. *Gas Age* **105**, 34-37, 68 (1950) *January* 5.

Progress on the building of super inch line in California is reported. Illustrations of the large machinery required are provided.

J. D. Parent

Production

Bush, R. E. and Mardock, E. S. SOME PRELIMINARY INVESTIGATIONS OF QUANTITATIVE INTERPRETATIONS OF RADIOACTIVITY LOGS. *J. Petroleum Technol.* **2**, *"Trans. Section"* 19-34 (1950) *January.*

There are two forms of radioactivity logging in use today: gamma ray and neutron curves. Gamma ray curves are obtained by lowering into wells a detector of gamma rays connected to surface recording instruments; an intensity vs. depth log is obtained as the detecting device is raised since the intensity of naturally emitted gamma rays at various depths is registered. In the neutron method the technique is similar but naturally emitted gamma rays are of secondary importance to those induced by neutrons produced by a capsule of a radium-beryllium mixture. The interpretation of such logs requires a knowledge of the dependence of radioactivity on lithologic conditions, and an effort is made by the authors to supply this. The neutron response depends on chemical composition and is very sensitive to fluids containing hydrogen, such as water and hydrocarbons. The authors report a relationship between porosity and response and suggest it as an improvement over core sampling as the penetration is greater. Relative methods for porosity of limestone have been devised.

J. D. Parent

Calhoun, J. C., Jr. ENGINEERING FUNDAMENTALS: CHANGE IN WELL CAPACITY WITH PERMEABILITY. *Oil Gas J.* **48**, 73 (1950) *February* 2.

Equations relating flow resistance of wells to change in permeability are presented. Methods which might cause permeability changes are briefly discussed.

O. T. Bloomer

Dale, C. R. INTERPRETATION OF TEMPERATURE SURVEYS IN PRODUCING WELLS. *Calif. Oil World* **43**, 3, 5, 8-9, 11 (1950) *January, 2nd issue.*

Temperature surveys both in flowing and shut-in conditions can be of great service in locating the lowest point of gas or liquid entry into the well bore, leaks in tubing or casing and migration of fluids in back of the casing. Illustrations are given.

J. D. Parent

George, J. B. HIGH-PRESSURE SETTINGS. *Oil Gas J.* **48**, 125 (1950) *February* 16.

In a recent installation vent lines were connected to the rupture diaphragms on the high pressure field separators. The vent lines discharge to a burn pit. This reduces the fire hazard and the damage to the surrounding installations when a rupture disk blows.

O. T. Bloomer

Mills, K. N. VIBRATION PROBLEMS IN DRILL PIPE. *World Oil* **130**, 83-86 (1950) *February* 1.

Basic causes of drill-pipe vibration are discussed, and mathematical means are presented for evaluating the effect. Basic equations together with data from a given well, enable the man at the rig to determine critical speeds, and to regulate drilling so as to eliminate danger zones. Typical graphs for standard drill pipe and normal mud are added to permit visual solution of most commonly met problems.

Author's abstract

Patnode, H. W. and Wyllie, M. R. J. PRESENCE OF CONDUCTIVE SOLIDS IN RESERVOIR ROCKS AS A FACTOR IN ELECTRIC LOG INTERPRETATION. TP-2797 *J. Petroleum Technol.* **2**, "*Trans. Section*", 47-52 (1950) *February.*

The effect of the conductivity of the rock substance itself on the resistivity of a rock containing brine was subjected to an experimental study involving both cores and slurries. The effect is shown to be significant and attention is called to the error introduced in electric log analyses by neglecting this factor.

J. D. Parent

Wickenhauser, L. J. GAS-DRIVE, GRAVITY-SEGREGATION, AND GAS-INJECTION CALCULATIONS. *Oil Gas J.* **48**, 52-54, 76-77 (1949) *December* 29.

An analysis is presented of the production history of a gas drive, gravity segregation reservoir in Venezuela. Methods of estimating the ultimate recovery, total oil in-place, and gas-oil relationships are presented and correlated with actual reservoir performance. Ultimate recovery is estimated as 40% of the oil in-place. Advantages of artificial gas injection into reservoirs of this type are cited.

O. T. Bloomer

Young, J. W., Millett, H. M. and Pierce, A. G. A. CALIBRATION OF CAPILLARIES FOR PERMEABILITY APPARATUS. *Petroleum Engr.* **22B**, 45, 48, 51 (1950) *February.*

A method of calibrating laboratory capillary tube flow meters is given. The reader is reminded that the Poiseuille law or the orifice law or a transitional one may be followed depending on flow conditions.

J. D. Parent

Sampling

McGlashen, W. A. HOW TO COLLECT A GAS SAMPLE FROM A HIGH-PRESSURE SOURCE. *Gas* **26**, 34-35 (1950) *February.*

This article provides a description of equipment for the safe collection, from a high pressure source, of a representative sample of natural gas in a container having a safe working pressure considerably lower than that of the source pressure. A description of a pressure relief assembly, fittings and conduit, with instructions for its assembly and use in gas sampling, is presented. This equipment will prevent the overpressurizing of conduit and container and eliminate unnecessary strain on valves and fittings resulting from repeated use of wrenches to make connections between the high pressure source of gas sample and the inlet of the gas sample container.

Author's abstract

The following articles, which have not been abstracted, are also called to your attention:

Thornton, D. P., Jr. NEW PLANT STRIPS WET GAS IN FIELD FOR CENTRAL HANDLING OF RICH OIL. *Petroleum Processing* 5, 135-138 (1950) *February.*

STORING PROPANE-AIR GAS UNDERGROUND. *Butane-Propane News* 12, 116, 119-120 (1950) *February.*

UNION PRODUCING COMPLETES MARINE GASSER. *Gas Age* 105, 33, 61 (1950) *January* 19.

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Schlegel, C. A. THE CYCLIC CATALYTIC REFORMING PROCESS FOR REFORMING NATURAL GAS. p. 42

Whalley, W. C. R. CATHODIC PROTECTION AND ITS APPLICATION TO THE IRAQ PIPELINES. p.48

EXPERIENCE WITH NATURAL GAS MANUFACTURED GAS SYSTEMS. p. 43

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Fischer-Tropsch Synthesis

Weller, S. and Friedel, R. A. ISOMER DISTRIBUTION IN HYDROCARBONS FROM THE FISCHER-TROPSCH PROCESS. *J. Chem. Phys.* 17, 801-803 (1949) *September.*

The isomer distribution in several Fischer-Tropsch fractions has been deduced from probability considerations and from four stated assumptions. The derivation involves the implicit assumption that the various isomers of a given molecular weight fraction add carbon atoms in proportion to their concentrations. Calculated and experimental concentrations agree with an average deviation of 0.7% when selected constants derived from the experimental data are used.

C. H. Riesz

Weller, S. and Friedel, R. A. ISOMER DISTRIBUTION IN FISCHER-TROPSCH HYDROCARBONS. *J. Chem. Phys.* 18, 157-158 (1950) *January.*

The concentrations of various isomers present in Fischer-Tropsch products has been calculated assuming that the isomers of a given cut add carbon atoms in proportion to the number of (weighted) ways that addition can occur to the individual isomers. The calculated results are slightly different than reported in a previous paper (see previous abstract) but average deviation of the calculated from the observed isomer concentrations was again 0.7%.

C. H. Riesz

Photogrammetry

Woodward, L. A. AERIAL PHOTOGRAMMETRY AS APPLIED TO THE PETROLEUM INDUSTRY. *J. Petroleum Technol.* 2, *"Section I."* 9-15 (1950) *January.*

Aerial photogrammetry not only simplifies field geology but many structures and features are easily found which could not be readily located on the ground, particularly in rough terrain. The use of this type of approach in prospecting and for picking the best location for pipe lines is amply illustrated.

J. D. Parent

Pipe Lines

Whalley, W. C. R. CATHODIC PROTECTION AND ITS APPLICATION TO THE IRAQ PIPELINES. *J. Inst. Petroleum* (British) 35, 705-734 (1949) *October.*

A detailed discussion is given of the application of cathodic protection to pipe lines laid in arid sandy soil. The soil characteristics—shallowness, dry, acidic—and infrequent rainfall necessitate special installations. The usual type installation is a shallow iron ground bed acting as the anode with oil immersed selenium rectifiers having a constant current output acting as the direct current source.

B. E. Hunt

Storage

THE REFINER'S NOTEBOOK — STORAGE LOSSES. *Oil Gas J.* **48**, 79 (1950) *January* 19.

A tabulation is presented of types of storage containers for petroleum products giving their operating principle, and the loss characteristics.

W. J. Merwin

Synthetic Fuels

Landa, I. S. POSSIBILITIES AND COSTS OF SYNTHETIC FUELS. *Petroleum Engr.* **22A**, 53-54, 56 (1950) *January.*

Synthetic fuel costs in Germany were high as shown by figures presented. Automatic control, improved synthesis methods and low-cost synthesis gas generation are only a few of the factors which can lead to a reduction in the cost of synthetic fuels.

C. H. Riesz

Roberts, G., Jr. and Schultz, P. R. LIQUID FUELS FROM COAL AND OIL SHALE. *Petroleum Refiner* **29**, 104-108 (1950) *January.*

See *Gas Abstracts* **5**, 246 (1949) *October* for previous abstract of this article.

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Culberson, O. L., Horn, A. B. and McKetta, J. J., Jr. PHASE EQUILIBRIA IN HYDROCARBON-WATER SYSTEMS. p. 45

7. ANALYTICAL METHODS AND TESTS

Gas Volume Measurement

Schmidt, R. W. PRECISE MEASUREMENT OF GAS VOLUMES IN GAS ANALYSIS. *Gas* **26**, 35-36 (1950) *February.*

The construction of a glass diaphragm type compensator for balancing pressures prior to making precise measurements of gas volumes during gas analysis is described. It is claimed that the compensator and method of measurement have the advantage of minimizing the possibility of mixing gases, together with an audible control of the pressure balance in the analyzer system.

H. Hakewill

Semimicrofractionation

Cruthirds, A. V., Jones, W. C. and Seyfried, W. D. SEMIMICROFRACTIONATION BY MEANS OF SPINNER COLUMNS. *Oil Gas J.* **48**, 117-119 (1950) *February* 16.

A semimicrofractionation column was developed to adequately fractionate small volumes of samples usually encountered in research work and also through a need in plant control operations. The column is essentially a vertical glass tube containing a suspended chromel band which may be rotated at high speeds. Advantageous features of the column are smaller holdup and increased efficiency and ruggedness of the column. The 24 in., 0.26 mm i.d. spinning band column has 11 theoretical plates at total reflux (H.E.T.P. of 2.2 in.) a maximum boil-up rate of 680 ml per hr, a holdup of 2.0 ml under operating conditions and 0.2 ml under static conditions, a pressure drop of only 10.5 mm of water, and can fractionate samples ranging from 10 to 200 ml. Good reproducibility is obtained, the average error of a cut point is 1.3° F by spinner distillation versus 1.6° F by packed-column distillation.

M. C. Miyaji

Sulfur Dioxide and Trioxide

Berk, A. A. and Burdick, L. R. A METHOD OF TEST FOR SO_2 AND SO_3 IN FLUE GASES. U.S. Report of Investigations 4618 (1950) January.

Revisions in the A.S.M.E. procedure for the determination of SO_2 and SO_3 in flue gases are described. Improved reliability of the modified procedure is attributed to prevention of sulfite oxidation and CO_2 interference. Data presented show variations of the order of 0.001% SO_3.

H. Hakewill

Vapor Pressure

Holliman, W. C. and Barker, M. G. A MANOMETRIC PRECISION PROCEDURE FOR DETERMINING THE VAPOR PRESSURE OF AVIATION GASOLINES. U.S. Bureau of Mines Report of Investigations 4635 (1950) January.

Apparatus and procedure for determining the vapor pressure of gasolines are illustrated and described. The method given is a modification of the Reid method, but is designed for increased precision. A feature of the apparatus is the substitution of a mercury manometer for the usual Bourdon-type gage employed. An average reproducibility of ± 0.04 psi is claimed.

H. Hakewill

8. GENERAL AND PHYSICAL CHEMISTRY

Compressibilities

Beattie, J. A., Marple, S., Jr. and Edwards, D. G. THE COMPRESSIBILITY OF, AND AN EQUATION OF STATE FOR GASEOUS ISOBUTANE. *J. Chem. Phys.* 18, 127-128 (1950) *January.*

Published data by the authors and others were used to determine the constants of the Beattie-Bridgeman equation of state for gaseous isobutane. These are: R = 0.08206, A_o = 16.6037, a = 0.11171, B_o = 0.23540, b = 0.07697, c = 3.00 x 10^4, in units of atmospheres, liters per mole and degrees Kelvin.

S. Katz

Mass Spectrometer

Mohler, F. L., Bloom, E. G., Williamson, L., Wise, C. E. and Wells, E. J. MASS SPECTRA FOR C_5H_8 ISOMERS. *J. Research Natl. Bur. Standards* 43, 533-536 (1949) *December.*

The mass spectra of spiropentane, methylenecyclobutane, cyclopentene, six dienes and 1-pentyne are described. An obvious correlation of the mass spectrum to molecular structure was not found, although distinctive characteristics are present for each compound. The ratio of total ionization to that of n-butane covers the same small range of values as other C_5 hydrocarbons. A prominent doubly charged ion spectrum in the case of some pentadienes is reported, with $C_3H_2^{++}$ the largest peak.

D. V. Kniebes

Tickner, A. W. and Lossing, F. P. MASS SPECTROMETRIC MEASUREMENT OF LOW VAPOR PRESSURES. *J. Chem. Phys.* 18, 148 (1950) *January.*

The errors inherent in conventional determinations of vapor pressures of hydrocarbons at low pressures due to traces of impurities are indicated. The use of the mass spectrometer for the determination of vapor pressures under these conditions is described.

S. Katz

Molecular Structure

Beebe, R. A., Kington, G. L., Polley, M. H. and Smith, W. R. HEATS OF ADSORPTION AND MOLECULAR CONFIGURATION. THE PENTANES ON CARBON BLACK. *J. Am. Chem. Soc.* 72, 40-42 (1950) *January.*

Adsorption isotherms and heats of adsorption were measured at 0°C for n-butane, n-pentane, neopentane and cyclopentane on carbon black. Certain apparent anomalies in the heats of adsorption are explained by a theory of geometric fit of the molecule on the adsorbing surface.

S. Katz

Steam

Keyes, F. G. THE VISCOSITY AND HEAT CONDUCTIVITY OF STEAM. *J. Am. Chem. Soc.* **72**, 433-436 (1950) *January.*

A survey and evaluation of recent work on the viscosity and thermal conductivity of steam has been made.

S. Katz

Thermodynamics

Binder, J. L. THE THERMODYNAMIC FUNCTIONS OF METHYL MERCAPTAN AND DIMETHYL SULFIDE. *J. Chem. Phys.* **18**, 77-78 (1950) *January.*

Entropies, free energy functions, heat capacities and heat contents of methyl mercaptan and dimethyl sulfide have been calculated from spectroscopic data at 100°K intervals from 298.16°K to 1500°K. Free energies of formation were also determined, referred both to rhombic sulfur and sulfur vapor.

S. Katz

Forziati, A. F., Norris, W. R. and Rossini, F. D. VAPOR PRESSURES AND BOILING POINTS OF SIXTY API-NBS HYDROCARBONS. *J. Research Natl. Bur. of Standards* **43**, 555-563 (1949) *December.*

The vapor pressures and boiling points in the pressure range between about 48 and 780 mm Hg have been measured. The data were fitted to the three-constant form of the Antoine equation relating vapor pressure to temperature, and the constants for all the hydrocarbons were evaluated.

S. Katz

Harle, G. A. MEASUREMENT OF THE RATIO OF THE PRINCIPAL SPECIFIC HEATS OF A GAS. *Nature* (British) **165**, 74 (1950) *January* 14.

A new method for the determination of the ratio of the specific heats is described. It is based on the hydrodynamic conditions applying when a gas effusing through an orifice into a low-pressure chamber changes from an expanding to a non-expanding jet.

S. Katz

Kobe, K. A. and Long, E. G. THERMOCHEMISTRY FOR THE PETROCHEMICAL INDUSTRY. PART VIII. SULFUR COMPOUNDS. *Petroleum Refiner* **29**, 126-130 (1950) *January.*

The eighth in a series of articles on the thermal properties of various compounds is concerned with gaseous sulfur compounds. As previously, useful tables such as reference sources of the most reliable experimental data, free energies of formation, heats of formation, heats of combustion, heat capacities and enthalpies on four different temperature scales between 0 to 3000°C or its equivalent, the mean molal heat capacities, and the coefficients for the empirically derived heat capacity equations are presented.

S. Mori

Roegiers, M. VAPOR PRESSURE, SURFACE TENSION, VISCOSITY AND EQUILIBRIUM PROPORTIONS OF IDEAL MIXTURES. PART II. PRACTICAL EQUATIONS FOR THE VARIOUS BLENDING LAWS. *Petroleum* (British) **13**, 39-41, 52 (1950) *January.*

This paper continues a summary of a lengthier monograph describing various equations applying to mixtures of ideal fluids. Equations included deal with vapor pressures, vapor viscosities, liquid surface tensions, liquid viscosities and liquid-vapor equilibrium. A computation of the liquid-vapor equilibrium composition of a binary mixture is included.

S. Katz

Transport Properties

Grew, K. E. TRANSPORT PROPERTIES OF GASES. *J. Chem. Phys.* **18**, 149-150 (1950) *January.*

In a paper published previously by Hirschfelder, Bird, and Spotz, all the calculated transport coefficients of the gases agreed with the experimental except for the thermal diffusion coefficient. In calculating the theoretical thermal separation ratio, if the diameter obtained from viscosity of a rigid sphere is used for the denominator term rather than for type (12, 6)

sphere as used by Hirschfelder et al, better correlation with the experimental may be obtained.

S. Mori

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Culberson, O. L., Horn, A. B. and McKetta, J. J., Jr. PHASE EQUILIBRIA IN HYDROCARBON-WATER SYSTEMS. p. 45

Elston, J. and Laffitte, P. REGIONS OF INFLAMMABILITY OF METHANE. p. 40

Gaydon, A. G. and Wolfhard, H. G. LOW-PRESSURE FLAMES AND FLAME PROPAGATION. p. 40

Long, R. EFFECT OF FINE PARTICLES ON IGNITION OF HYDROGEN/AIR MIXTURES. p. 40

Weller, S. and Friedel, R. A. ISOMER DISTRIBUTION IN HYDROCARBONS FROM THE FISCHER-TROPSCH PROCESS. p. 48

10. CHEMICAL ENGINEERING

Absorption

Molstad, M. C. and Parsly, L. F., Jr. PERFORMANCE OF DRIP-POINT GRID TOWER PACKINGS. V. ABSORPTION OF ETHANOL VAPOR. *Chem. Eng. Progress* **46**, 20-28 (1950) *January.*

The absorption of ethanol vapor in water was studied using a $15\frac{1}{4}$ in. square tower packed with No. 6295 Drip-Point Grids, 1-in. Raschig rings, and 1-in. Berl saddles. Packed heights of one and two feet were used. Variation of $K_g a$ with gas rate was studied at three or more liquid rates. Values of G varied from 200 to 1200 lb/(hr)(ft^2) and L from 1000 to 15000 for the grids, 300 to 13,000 for the rings, and from 400 to 4000 for the saddles.
L = lbs liquid/(hr)(ft^2). $K_g a$ vs. G at constant L was a simple power function of G, increasing with decreasing values of L for both the rings and saddles. This function holds up to the loading point. Comparisons with $K_g a$ values calculated from the results of investigations on ammonia absorption and humidification were favorable. An unexpected large effect of liquid rate for the grid packing was observed which could not be explained by liquid distribution, concentration, surface effects, and reaction effects. Effect of packed height is an important consideration. It is felt that $K_l a$ liquid coefficient is independent of height, while $k_g a$ gas coefficient is approximately inversely proportional to the cube root of packed height.

C. L. Tsaros

Parsly, L. F., Jr., Molstad, M. C., Cress, H. and Bauer, L. G. PERFORMANCE OF DRIP-POINT GRID TOWER PACKINGS. IV. ADDITIONAL GAS-FILM MASS-TRANSFER COEFFICIENTS. *Chem. Eng. Progress* **46**, 17-19 (1950) *January.*

Measurements of absorption coefficients of ammonia in water using a No. 6295 Drip-Point Grid packing were made. The packing consists of $7\frac{3}{4}$ x $7\frac{3}{4}$ x $6\frac{3}{4}$ inches ceramic blocks each with 14 slots to permit passage of gas and liquid. When stacked in a tower, the structure consists of a large number of short narrow, practically rectangular wetted wall columns arranged in series-parallel, essentially-complete wetting being obtained over a wide range of liquid flows. Overall $K_g a$ values were determined at constant liquid and varying gas rate, the function being $G^{0.8}$. A regular increase of $K_g a$ with liquid rate was observed. Gas film coefficients $k_g a$ were obtained by subtracting from overall resistances liquid film resistances calculated from oxygen desorption data resistances. A single line was obtained of $k_g a$ vs. gas rate, which correlated all points with a maximum deviation of 20.2% and average of 7.9%. The equation of this line was $K_g a = .0774 G^{0.8}$, where G = mass velocity of gas. Below G of 350, for the three highest liquid rates, the power function of G changes from .83 to 1.45, characteristic of the change of heat-transfer from the turbulent region to the upper transition region. The gas-film coefficients vary in a manner expected for a wetted wall column with considerable entrance turbulence.

C. L. Tsaros

Decantation

Mastin, M. G. COUNTERCURRENT DECANTATION: NEW APPROACH MAKES CALCULATIONS EASY. *Chem. Eng.* 57, 100-101 (1950) *January.*

A method of calculating counter-current decantation operations is presented. To simplify calculations, volumes instead of weights are used as the basis. Six simplifying assumptions are made, and examples are given of application of the method.

C. L. Tsaros

Diffusion

Wilke, C. R. DIFFUSIONAL PROPERTIES OF MULTI-COMPONENT GASES. *Chem. Eng. Progress* 46, 95-104 (1950) *February.*

The problem of diffusion in multicomponent systems has been analyzed. Included in the work is a means of calculating the viscosity of gaseous mixtures.

J. D. Parent

Distillation

Murdoch, P. G. MULTICOMPONENT DISTILLATION. II. APPLICATION OF ALGEBRAIC EQUATIONS TO DOUBLET SEPARATIONS. *Chem. Eng. Progress* 46, 36-43 (1950) *January.*

The algebraic equations previously presented for multicomponent distillation calculations (See *Gas Abstracts* 5, 12 (1949) *January*) are extended to "doublet separations"; these are separations in which the key components are adjacent and are the only components appearing in appreciable proportions in both products of a distilling column. A simple trial and error method of solving the equations is presented. Constant relative volatility and constant molal reflux are assumed in this development.

O. T. Bloomer

Fluid-Solid Flow

Zenz, F. A. TWO-PHASE FLUID-SOLID FLOW. *Ind. Eng. Chem.* 41, 2801-2806 (1949) *December.*

A study was made of the pressure drop occurring in vertical and horizontal transport of solids for various linear velocities of gas flow. Empirical correlations of the data have been made. A schematic phase diagram for particle-gas systems is developed.

W. J. Merwin

Fluidized Beds

Weintraub, M. and Leva, M. PRESSURE DROP THROUGH FIXED FLUIDIZED BEDS — A NOMOGRAM. *Chem. Eng.* 57, 110-113 (1950) *January.*

A nomogram is presented whereby the pressure drop through fixed and fluidized beds may be estimated.

W. J. Merwin

Fractionation

Uitti, K. D. CONTROL POINT LOCATION AND ITS EFFECT ON FRACTIONATOR COLUMN OPERATION. *Petroleum Processing* 5, 41-44 (1950) *January.*

Calculations were made to determine the best control points in an 18 plate laboratory fractionating column operating on propane-isobutane mixtures. These were found to be the fourth and thirteenth plates from the top. Calculations were then made to determine the effect of various feed compositions, the effect of holding reflux rate constant, and the effect of constant reflux to feed ratio. Charts showing the results of the calculations are presented.

W. J. Merwin

Yu, K. T. and Coull, J. VALUATION OF EQUILIBRIUM STAGES AND TRANSFER UNITS. *Chem. Eng. Progress* 46, 89-94 (1950) *February.*

A simple correlation is worked out for the number of transfer units in a packed column in terms of the number of minimum number of stages and the ratio of the actual reflux ratio to the minimum reflux ratio. Some useful SEVENTEEN—Gas Abstracts 3217 Vic empirical relations are worked out for liquid-vapor equilibria in non-ideal systems. The relation of the theoretical plates to transfer units in fractionators is analyzed.

J. D. Parent

Thermal Conductivity

THE MEASUREMENT OF THERMAL CONDUCTIVITY. *Ceramics* 1, 614-618 (1950) *January.*

A thermal conductivity apparatus based on the "plane plate" method was employed successfully in obtaining conductivity values of insulating brick, silica and chrome magnesite brick at mean temperatures up to 1100°C. The apparatus consists of a 9 x 9 x 3 inches deep test section insulated on all sides, a main heater immediately below the test section, a water calorimeter above the insulation covering the top of the test section, and provided with peripheral heaters and thermocouples to minimize heat losses and end effects in the test block. The main heaters are fabricated from 16 gauge Kanthal A wire which has operated successfully above 1200°C. Diagrams illustrating the construction are included.

C. Von Fredersdorff

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Cooling Towers

Degler, H. E. WINTER TIPS ON COOLING TOWERS. *Operating Engr.* 3, 36-37 (1950) *January.*

The steps to be taken to prevent fogging in water cooling towers and to prevent water freezing are briefly listed.

W. J. Merwin

Distribution

James, L. S. INSTRUMENTATION AND GRID CONTROL—SOME FURTHER DEVELOPMENTS. *Gas J.* (British) 260, 720-722, 730 (1949) *December* 21.

A discussion is presented together with pictures and diagrams of the instrumentation used in a distribution system in Wales.

W. J. Merwin

Flow Meters

Nolte, C. B. HISTORY OF BELLOWS-ACTUATED FLOW METERS. *Instruments* 23, 79-84 (1950) *January.*

The development of bellows for measuring differential pressures is traced from the first simple device to the present day model which has the following features: over-range protection; ambient temperature compensation; torque tube movement; pulsation dampening; and automatic draining of condensate.

W. J. Merwin

Foundations

Osburn, R. W. SOIL PRESSURE UNDER FOUNDATIONS. *Petroleum Refiner* 28, 123-124 (1949) *December.*

The author presents an algebraic and a graphical method of determining the off-center loading of a foundation for a tower subjected to wind load.

W. J. Merwin

Heat-Flow Meter

Hatfield, H. S. and Wilkins, F. J. A NEW HEAT-FLOW METER. *J. Scientific Instruments* 27, 1-3 (1950) *January.*

This heat flow meter works on the principle of thermal emf generation by a disk of tellurium-silver alloy with copper gauze on its two sides. The output of the disk is 2 microvolts for a flow of 1 Btu/ft² hr. A galvanometer is used to indicate emf. The disk is calibrated by placing it in a measured heat flow. It is intended for use in measuring heat flow through walls in connection with air conditioning.

W. J. Merwin

Hydrogenation Plant

Markovits, J. A., Braun, K. C., Donovan, J. T. and Sandaker, J. H. SPECIAL EQUIPMENT IN THE COAL-HYDROGENATION DEMONSTRATION PLANT. U.S. Bureau of Mines Report of Investigations 4584 (1950) January.

Detail drawings, descriptions and pictures are presented of the special equipment used in the coal hydrogenation demonstration plant. These items include the high pressure vessels, preheaters, heat exchangers, hydrogen and nitrogen compressors, pumps, flanges, tubing, fittings and valves.

W. J. Merwin

Piping

Blick, R. G. PIPE SUPPORTS AND PIPE RESTRAINTS. *Petroleum Refiner* **28**, 128-138 (1949) *December.*

A general discussion is presented of the following kinds of piping: pump and compressor; tower and drum; fired heater piping and anchors; exchanger piping; and yard piping. Tables and charts are presented whereby the spacing of supports for these kinds of piping can be determined. A section of the article is devoted to a derivation of equations.

W. J. Merwin

Dickson, R. A. PIPE COST ESTIMATION. *Chem. Eng.* **57**, 123-124, 135 (1950) *January.*

A series of N factor charts are presented for 40 different materials used in chemical process piping. The N factor is the ratio of cost of pipe of one size to the cost of pipe of another size. By the use of the charts and additional data presented, the cost of process piping may be estimated.

W. J. Merwin

Pressure Vessels

Miller, B. ARE PRESSURE VESSELS TOO THICK? *Chem. Eng.* **57**, 95-98 (1950) *January.*

The author points out that higher allowable stresses are permitted by the American Standard Code for Pressure Piping than are allowed by the ASME code for pressure vessels. For example, 50 containers for natural gas storage have been operating satisfactorily at 2,240 psi with a metal thickness which would allow only 950 psi operating pressure under the pressure vessel code. The Pressure Piping Code sets the maximum allowable working pressure at 80% of the pressure at which the pipe was tested at the mill, whereas the ASME-UPV code sets the valve at ¼ of the ultimate strength.

W. J. Merwin

Thermocouples

Morgan, F. H. and Danforth, W. E. THERMOCOUPLES OF THE REFRACTORY METALS. *J. Applied Phys.* **21**, 112-113 (1950) *February.*

The following refractory thermocouple systems were investigated at elevated temperatures: tungsten-tantalum to 3000°C, tungsten-molybdenum to 2600°C, tantalum-molybdenum to 2600°C and tungsten-tungsten 50% molybdenum to 2900°C. It was noted that the curves of voltage against temperature pass through maxima for the couples involving tantalum. The other two couples show a mean slope of about 5 to 6 microvolts per degree. Sensitivities decrease sharply beyond about 2500°C.

S. Katz

12. MATERIALS OF CONSTRUCTION

Corrosion

Ashkinazy, S. B. and Joyce, J. M. GALVANIC CORROSION—WHAT IT IS AND HOW IT CAN BE AVOIDED. *Materials & Methods* **31**, 49-53 (1950) *February.*

The essential principles involved in galvanic corrosion are explained. Practical measures for preventing this type of corrosion are presented. Particular attention is given to the installations of magnesium or aluminum with other structural metals.

B. E. Hunt

Bond, D. C. and Marsh, G. A. CORROSION OF WET STEEL BY HYDROGEN SULFIDE-AIR MIXTURES. *Corrosion* **6**, 22-28 (1950) *January.*

Laboratory tests were conducted to determine the initial rate of corrosion and the nature of the corrosion products formed by the action of H_2S-air mixtures on wet steel. The results indicate a fairly uniform increase in per cent sulfide as the H_2S content increases and that free sulfur is present at all concentrations of H_2S. The rate of conversion of iron oxide is more rapid than the reverse reaction.

B. E. Hunt

LaQue, F. L. PREVENTION OF CORROSION BY MEANS OTHER THAN PROTECTIVE COATINGS. *Corrosion* **6**, 72-78 (1950) *February.*

Corrosion may be prevented by means of controlling the environment-humidity control, deaeration and the usage of inhibitors, by the

application of cathodic protection, by a proper design of the system, and by varying the composition of the metal. A bibliography is included which would act as a guide to a detailed study of the subject.

B. E. Hunt

Palmquist, W. W. GRAPHITE ANODES FOR CATHODIC PROTECTION. *Petroleum Engr.* **22D**, 22-24 (1950) *January.*

The use of carbon or graphite anodes is suggested for certain applications where there is available an external source of direct current. Special carbonaceous back fills which provide an increased active anode surface are described.

B. E. Hunt

Uhlig, H. H. THE COST OF CORROSION TO THE UNITED STATES. *Corrosion* **6**, 29-33 (1950) *January.*

The cost of corrosion is estimated to be 5.5 billion dollars per year. This estimate was obtained by totalling the amount of money spent on paints, coatings, alloys, and replacements of equipment. Methods available to combat corrosion include: use of alloys; cathodic protection; use of inhibitors; deaeration of boiler feed water.

W. J. Merwin

Wise, R. B. A PRACTICAL APPROACH TO THE PROBLEM OF COOLING-WATER SLIME. *Oil Gas J.* **48**, 170, 173, 177-178 (1950) *February* 23.

The importance of a correct interpretation of microbiological water analysis is stressed, due to its value in determining the type of slimicid or bactericide to be used. Three types of organisms, algae, bacteria, and fungi, are the major source of trouble although the mere presence of these organisms does not indicate trouble. A breakdown of these three groups into their major subdivisions and a list of trouble-causing organisms is given.

B. E. Hunt

Refractories

Clements, J. F., Vyse, J. and Rigby, G. R. H. INVESTIGATIONS ON REFRACTORY INSULATING MATERIALS. Gas Research Board GRB-53, 27-45 (1949) November.

This review of recent and current studies on properties of refractory materials deals principally with testing methods. The topics include a "heat dissipation test" for accelerated measurement of thermal conductivities. The effect of excessive firing on thermal conductivity has been studied. A major part of the program consisted of attempts to formulate a shrinkage test. A new apparatus is described for the measurement of thermal conductivities of refractories.

S. Katz

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Laming, J. and Rigby, G. R. THE DURABILITY OF CARBONIZING REFRACTORIES IN CONTINUOUS VERTICAL RETORTS. p. 44

13. NEW BOOKS

Heat Transfer

Jakob, M. HEAT TRANSFER. New York, John Wiley and Sons, 1949.

The book is an excellent treatise on heat transfer. Most advanced mathematics has been eliminated so that it would not compete with such texts as Carslaw in the field of conduction. However, sufficient mathematics has been presented in order to handle most engineering problems. The most outstanding features of the text are those chapters dealing with the application of finite differences to the solution of problems in conduction. Another outstanding chapter is the one on experimental analogy methods for the solution of heat-conduction problems. Very few numerical problems are solved in the text in order to illustrate the material which is presented. There are many fine problems in the appendix, but very few solutions are presented. The reviewer considers the text to be the best and the most complete work in the field at this time.

R. E. Peck

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